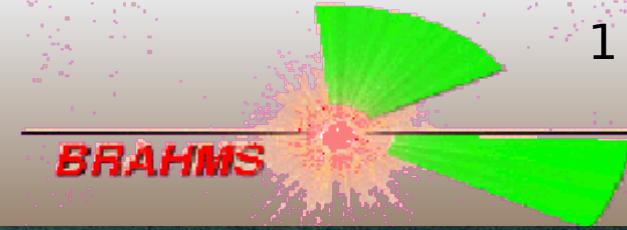


BRAHMS @ RHIC

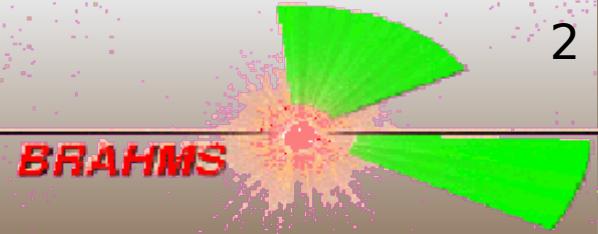
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Nov. 14-20, 2006



Forward Nuclear Modification Factor in Au-Au
and Cu-Cu Collisions at $\sqrt{s_{NN}} = 62.4 \text{ GeV}$
Truls Martin Larsen
Niels Bohr Institute
for the BRAHMS Collaboration

Forward Nuclear Modification Factor in Au-Au and Cu-Cu Collisions



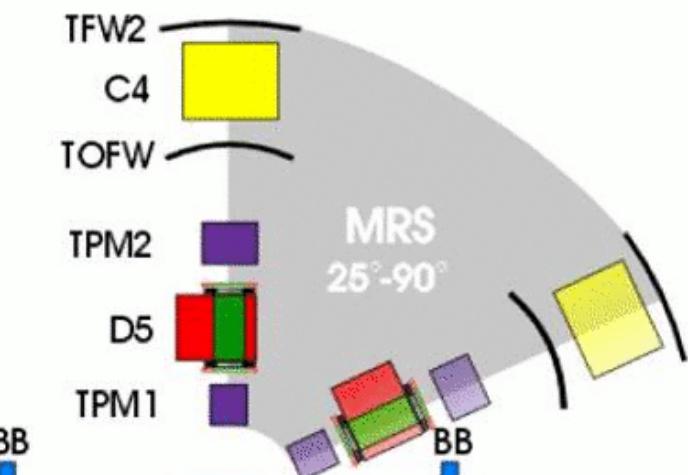
- The Broad RAnge Hadron Magnetic Spectrometers
- Probing the medium with R_{cp} and R_{AA}
- Results at $\sqrt{s_{NN}} = 62.4 \text{ GeV}$
 - p-p at $\eta = 3.1$
 - Au-Au at $\eta = 0, 0.9$ and 3.1
 - Cu-Cu at $\eta = 0, 0.9$ and 3.1
 - Au-Au compared to Cu-Cu
- Summary

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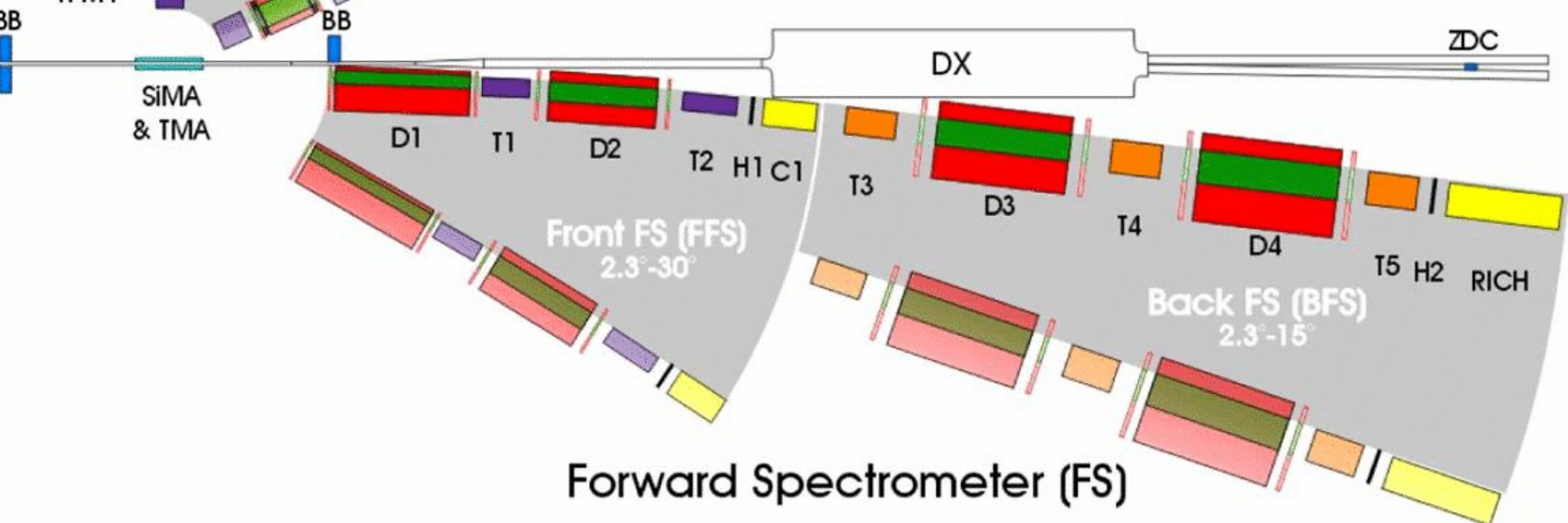
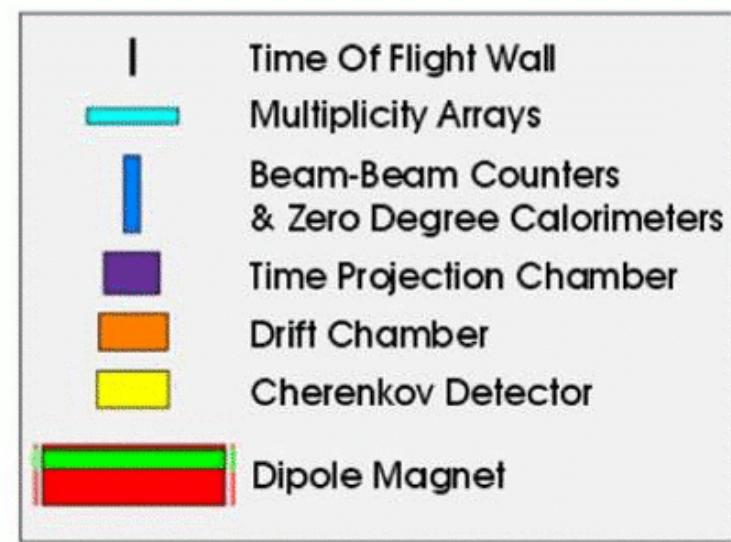
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BRAHMS Experimental Setup

Mid Rapidity Spectrometer



100 cm

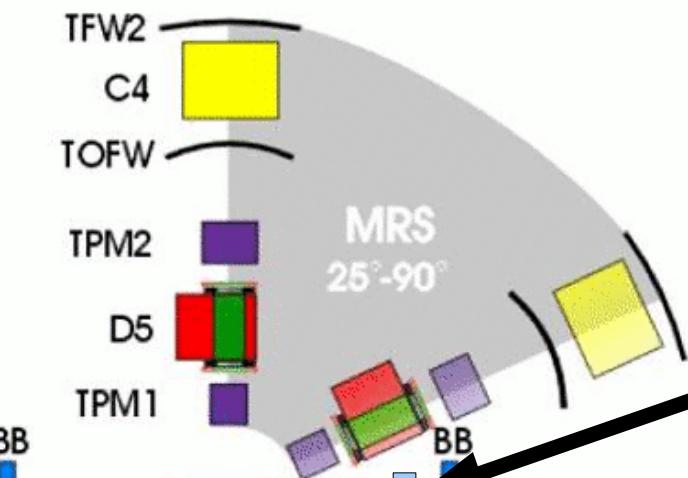


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BRAHMS Experimental Setup

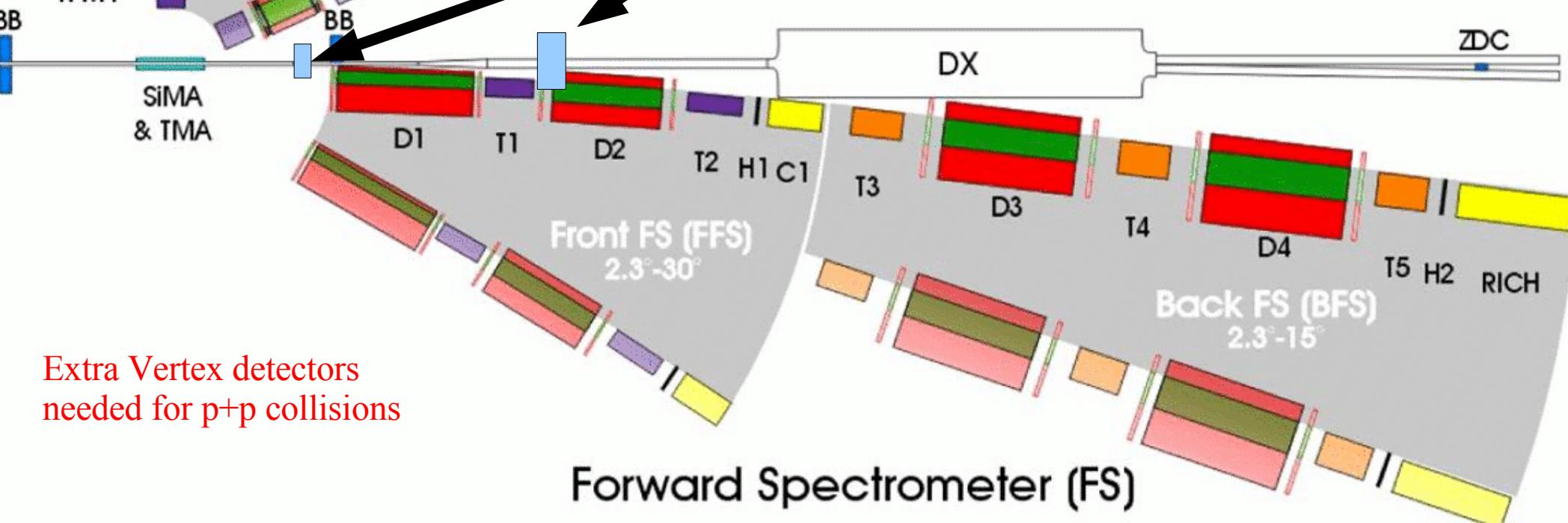
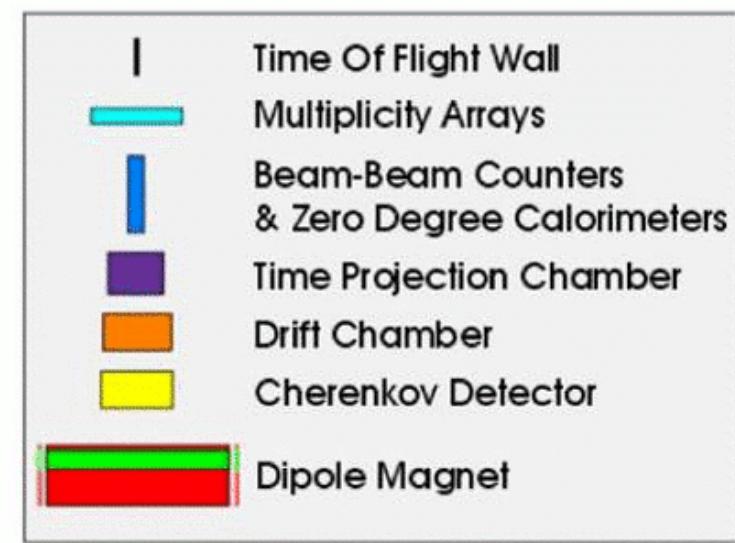
Mid Rapidity Spectrometer



MRS
25°-90°

100 cm

Cherenkov Radiators



Using high p_T particles to probe the medium

BRAHMS

- Construct invariant transverse momentum yields
 - Centrality bins: 0-10%, 10-20%, 20-40%, 40-60%
- Scale yields with the number of binary collisions
- Make ratio of central collisions to peripheral collisions, R_{cp} :

$$\frac{d^2 N_{0-10\%}^{AB}}{2\pi p_T d\eta dp_T}$$

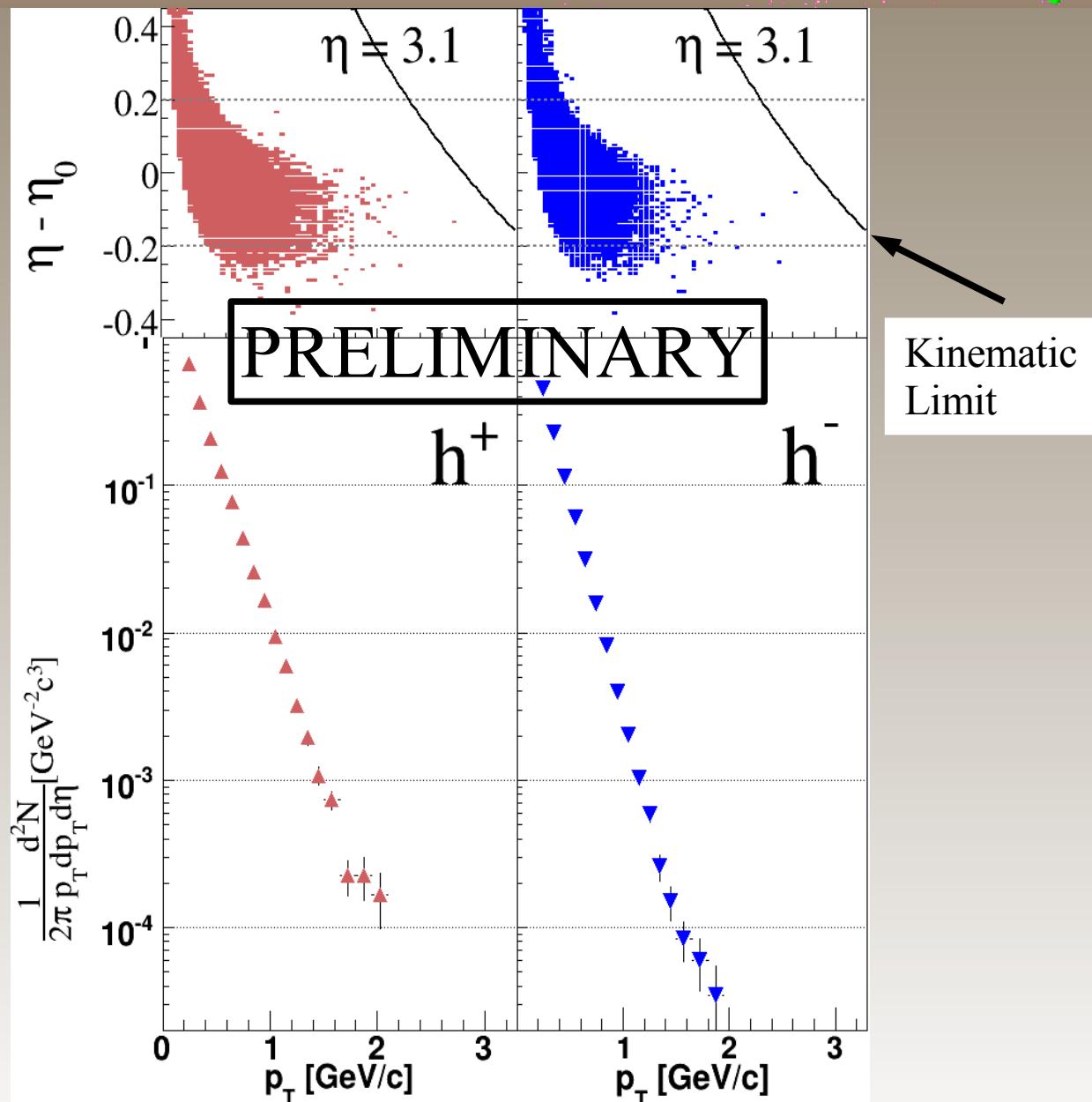
$$R_{cp} = \frac{\frac{d^2 N_{0-10\%}^{AB}}{\langle N_{0-10\%}^{bin} \rangle d\eta dp_T}}{\frac{d^2 N_{40-60\%}^{AB}}{\langle N_{40-60\%}^{bin} \rangle d\eta dp_T}}$$

- Make ratio of nucleus-nucleus to pp collision yields, R_{AB} :

$$R_{AB} = \frac{\frac{d^2 N^{AB}}{\langle N_{bin}^{AB} \rangle d\eta dp_T}}{\frac{d^2 N^{pp}}{d\eta dp_T}}$$

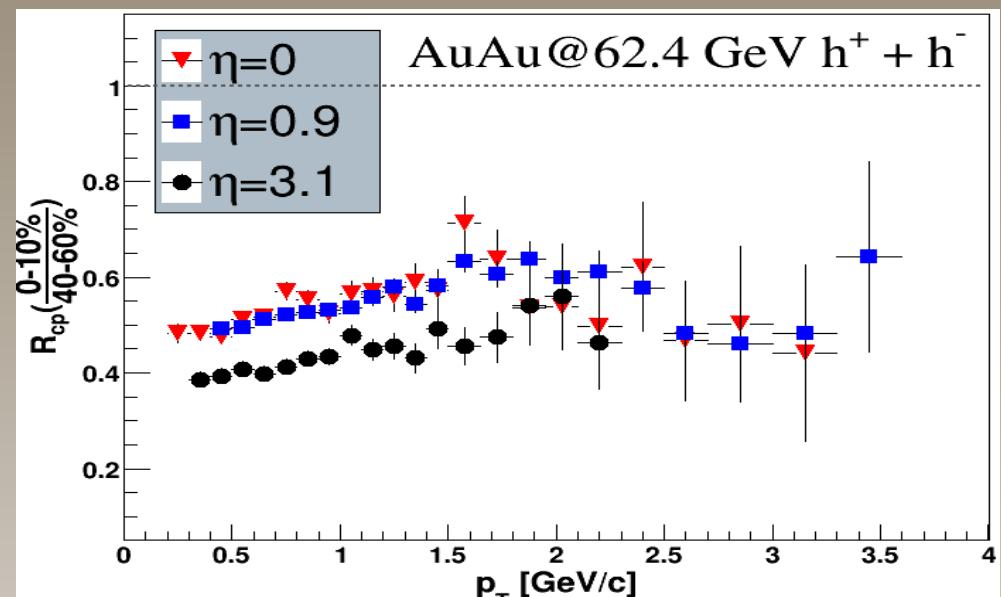
pp reference data at forward rapidity

- BRAHMS data analyzed at $\eta=3.1$ with the Front Forward Spectrometer
- Not corrected for decay or absorption
- pp at midrapidity from fit to ISR data

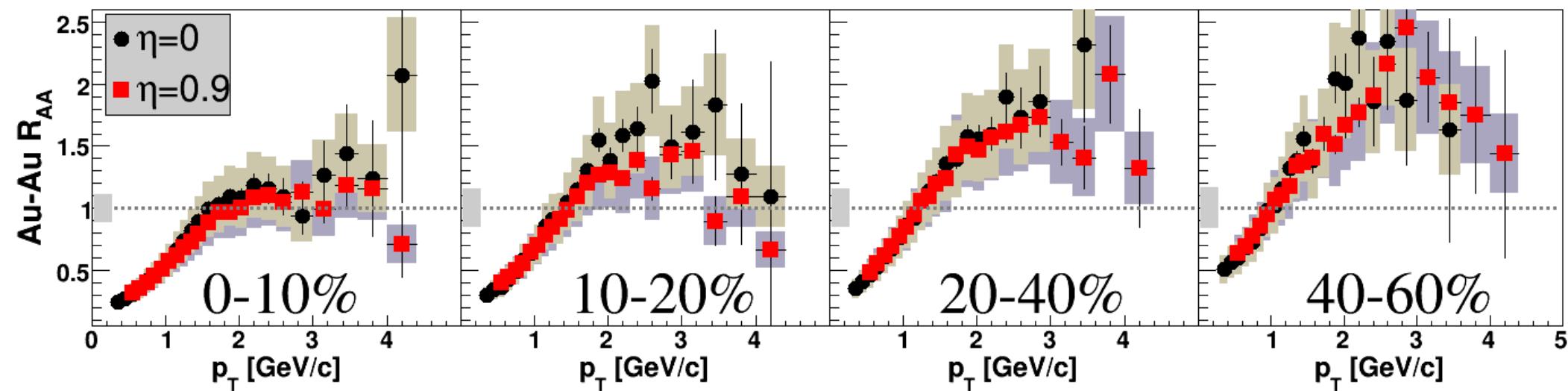


Au-Au at midrapidity

- › $(h^+ + h^-)/2$ at $\sqrt{s_{NN}} = 62.4 \text{ GeV}$
- › Binary collisions calculated using optical Glauber
- › R_{cp} similar to 200 GeV
- › R_{AA} show no suppression at midrapidity and enhancement for semi peripheral collisions
- › pp spectra fitted to ISR data



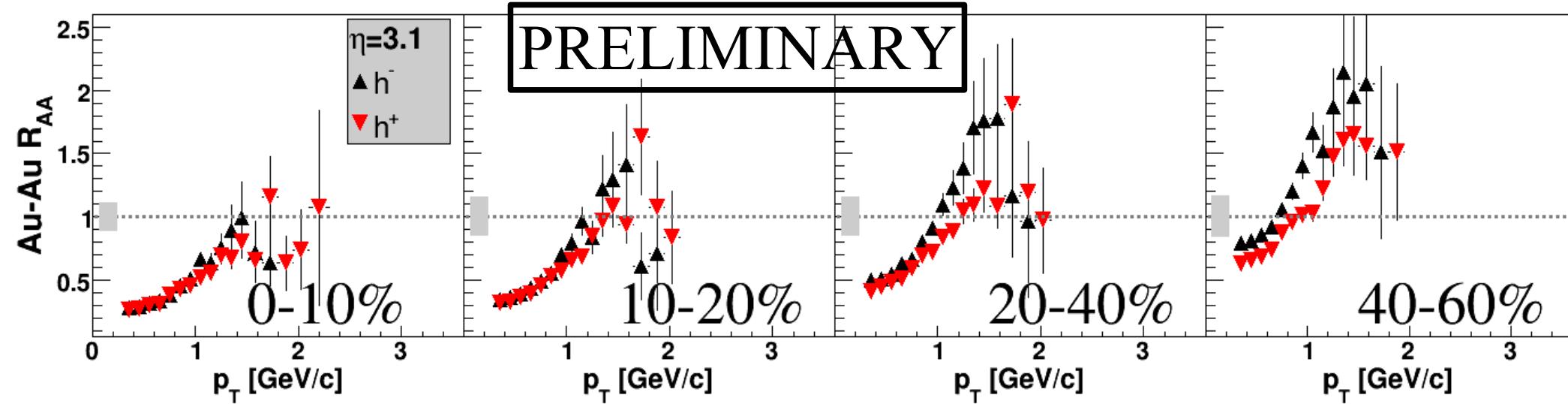
[Submitted to Phys.Lett.B nucl-ex/0602018]



Au-Au R_{AA} at forward rapidity

BRAHMS

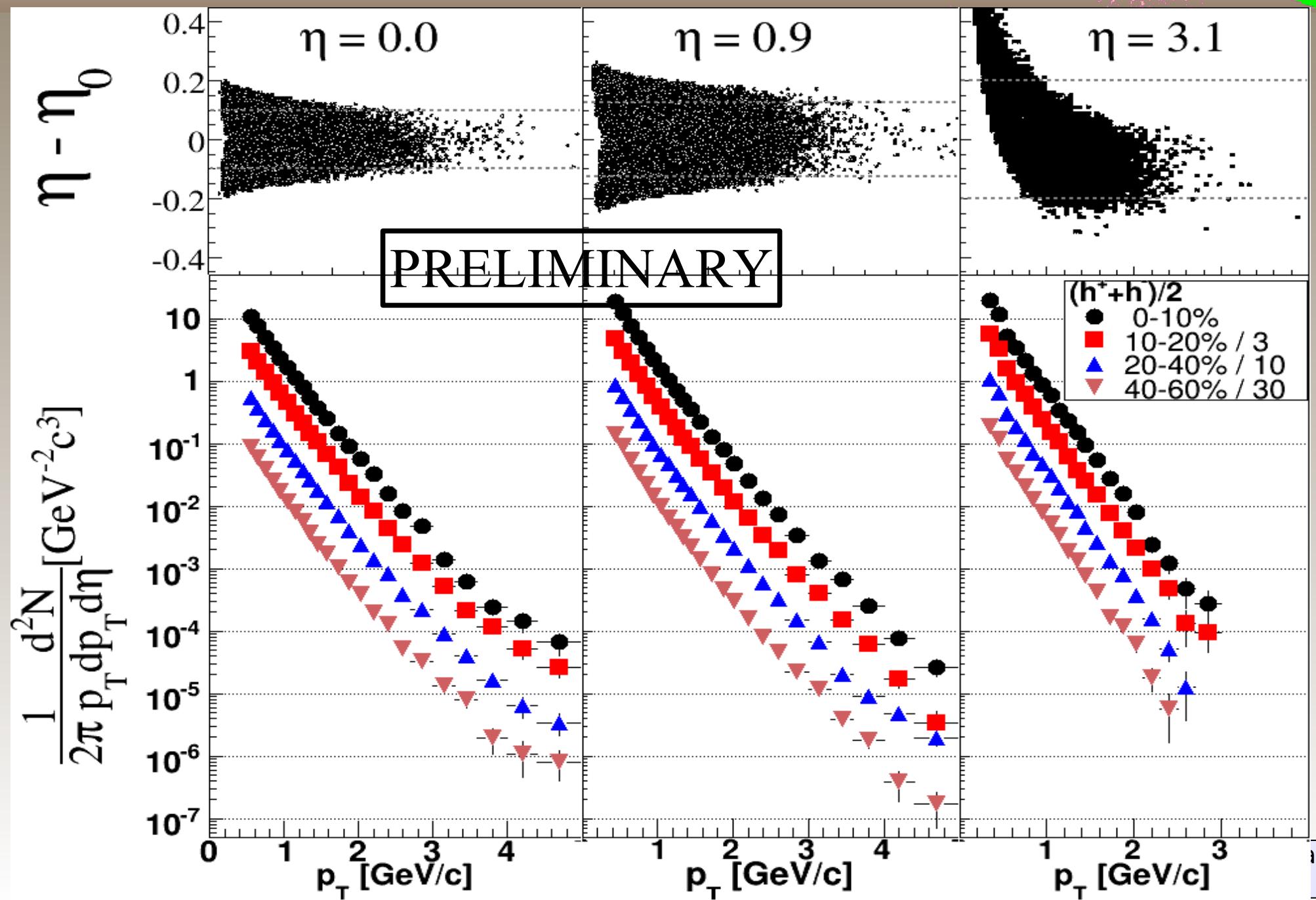
PRELIMINARY



- BRAHMS p+p spectra
- Grey error band shows the total systematic uncertainty
- Forward rapidity increasing enhancement for more peripheral collisions
- Small charge difference for more peripheral collisions

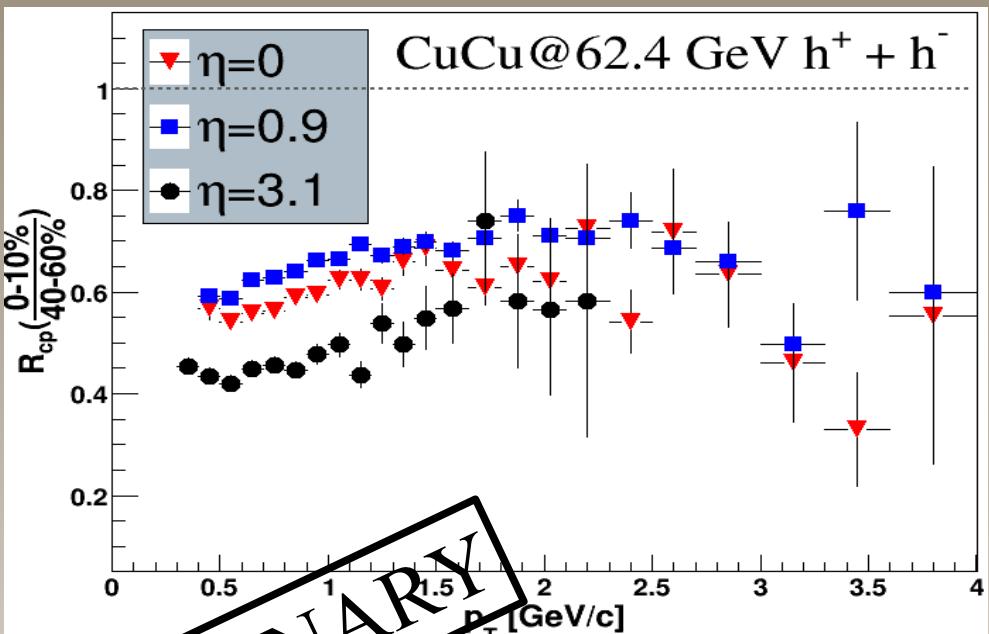
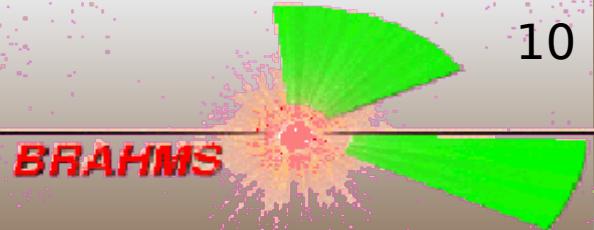
Cu-Cu transverse momentum spectra

BRAHMS

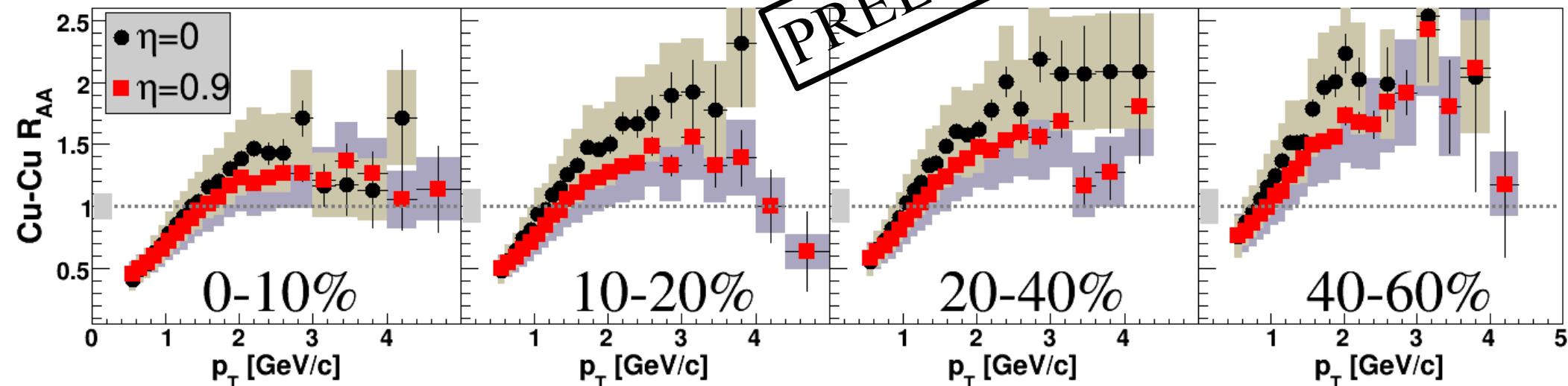


Cu-Cu at midrapidity

- › $(h^+ + h^-)/2$ at $\sqrt{s_{NN}} = 62.4 \text{ GeV}$
- › R_{cp} results similar to Au-Au
- › R_{AA} show enhancement from central to semi peripheral collisions
- › pp spectra fitted to ISR data



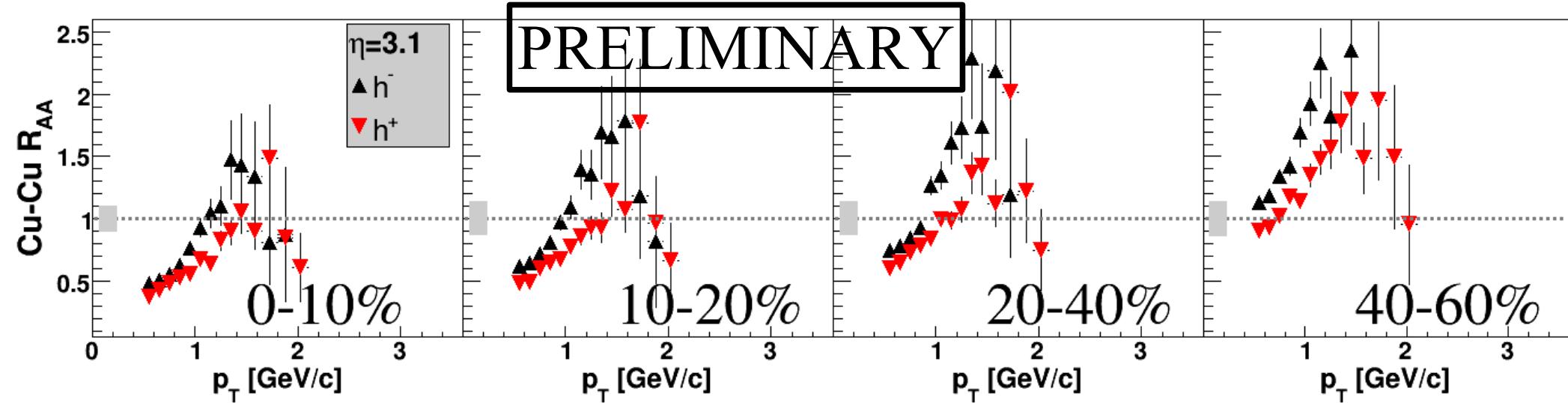
PRELIMINARY



CuCu R_{AA} at forward rapidity

BRAHMS

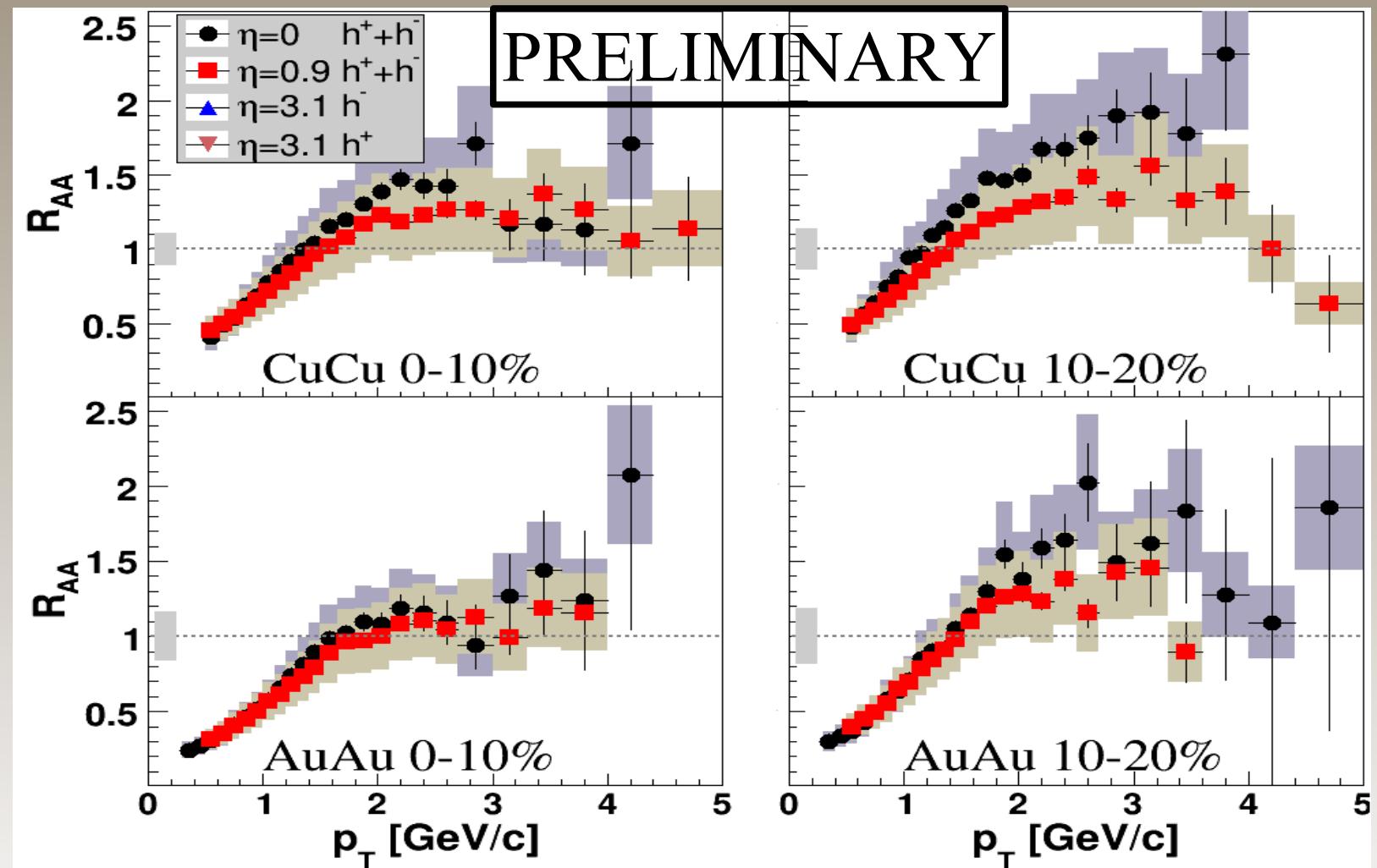
PRELIMINARY



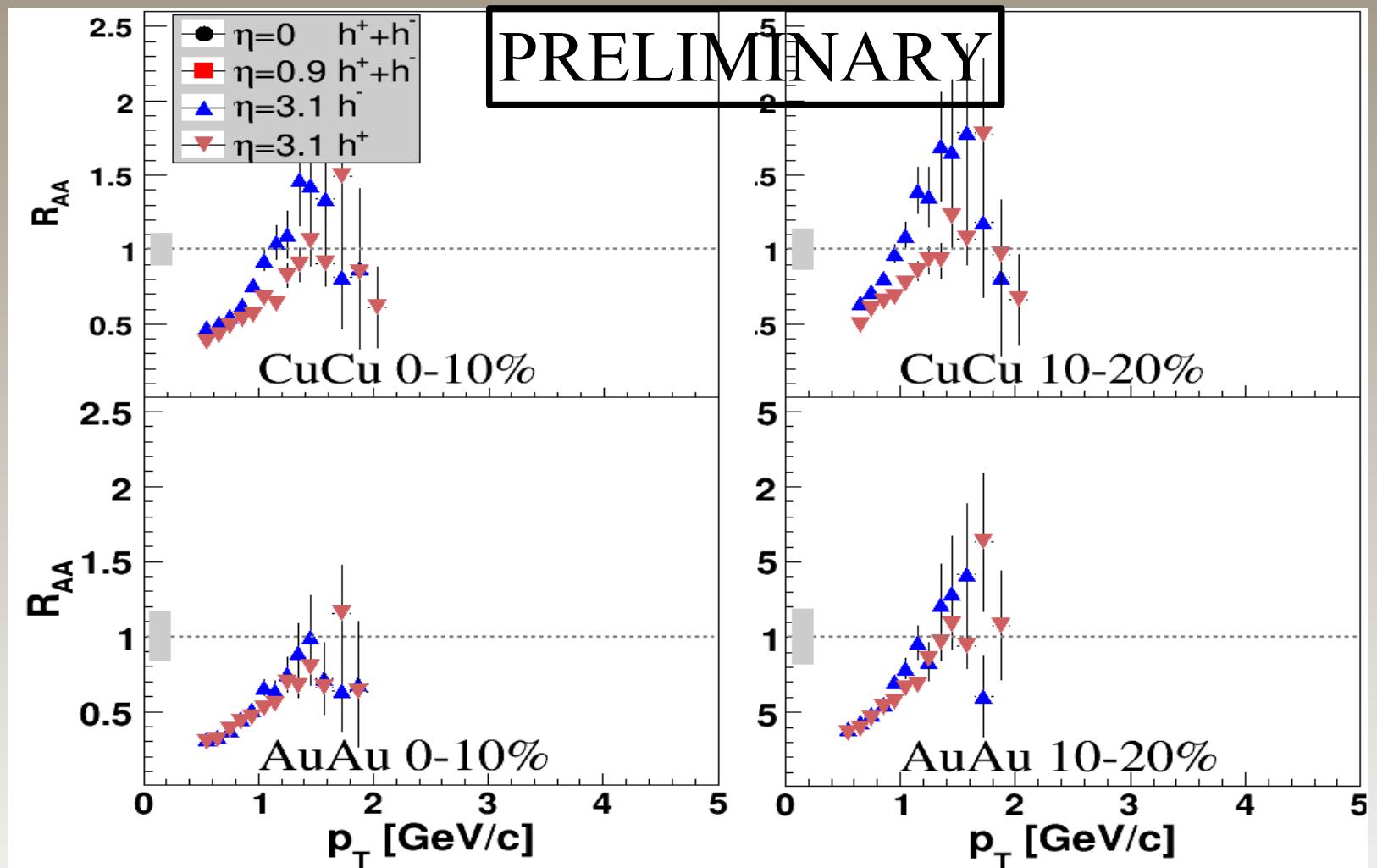
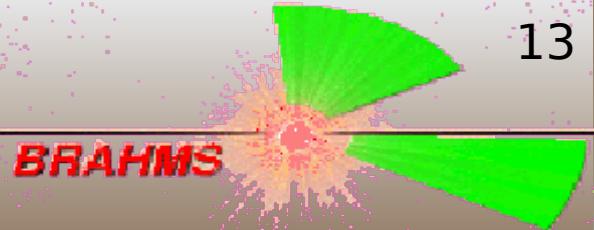
- BRAHMS p+p spectra used
- Grey error band shows the total systematic uncertainty
- Forward rapidity increasing enhancement from central to semi peripheral collisions
- Small charge difference for more peripheral collisions

Au-Au compared to Cu-Cu

BRAHMS

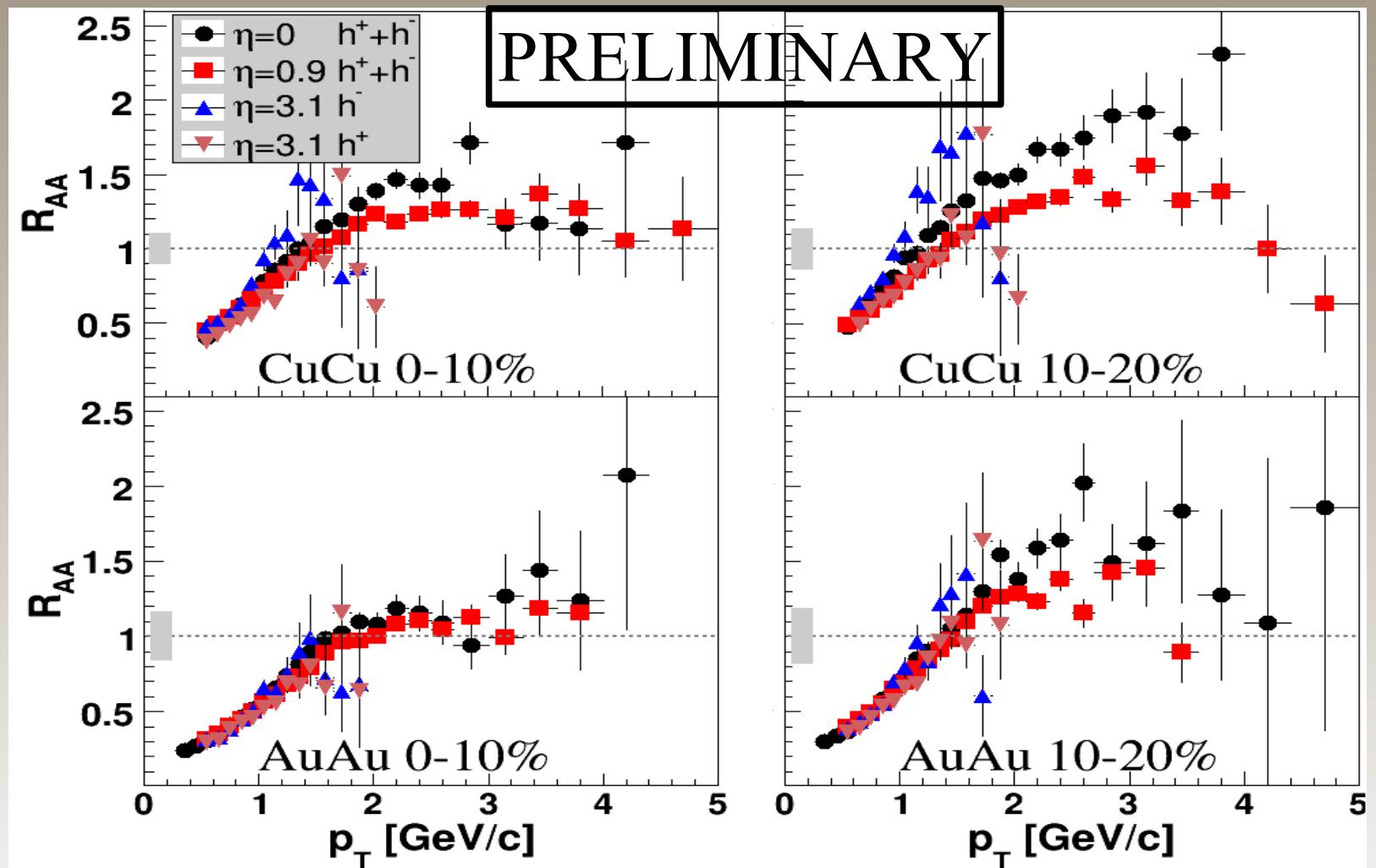


Au-Au compared to Cu-Cu

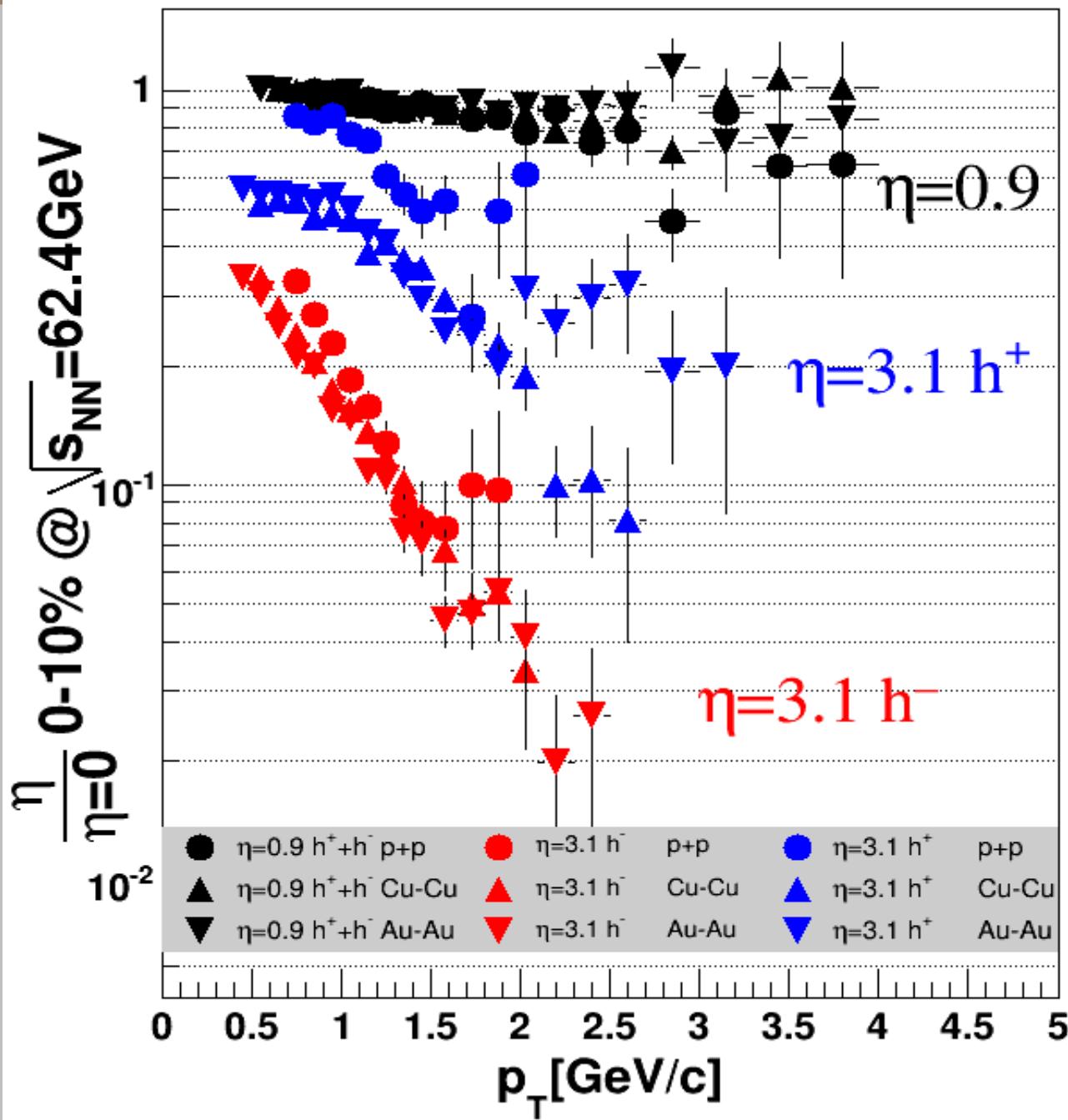
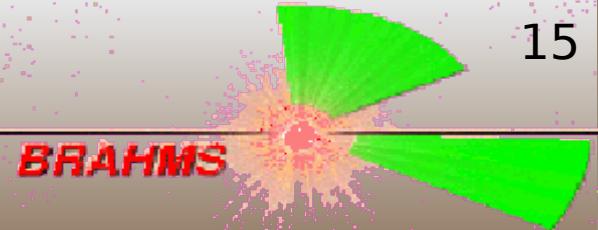


Au-Au compared to Cu-Cu

BRAHMS

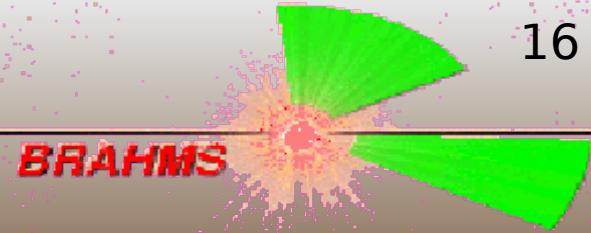


Comparing Au-Au, Cu-Cu and p+p



➤ Ratio in figure is:

$$\frac{\text{Spectra}@ \eta}{\text{Spectra}@ \eta = 0}$$



Summary

- Central-to-peripheral ratio shows no p_T dependence, and no dependence on system size
- Increasing Cronin Enhancement from central to peripheral collisions in the nuclear modification factor
- Nuclear modification factor show same features at mid and forward rapidity for both system

BRAHMS Collaboration



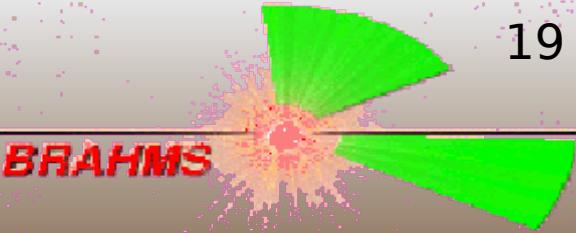
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Back-up slides

BRAHMS



N_{bin} collisions

- Au-Au at 62.4 GeV:
 - $\langle N_{\text{bin}} \rangle (0\text{-}10\%) = 752 \pm 100$
 - $\langle N_{\text{bin}} \rangle (10\text{-}20\%) = 459 \pm 71$
 - $\langle N_{\text{bin}} \rangle (20\text{-}40\%) = 217 \pm 41$
 - $\langle N_{\text{bin}} \rangle (30\text{-}45\%) = 142 \pm 30$
 - $\langle N_{\text{bin}} \rangle (38\text{-}50\%) = 97 \pm 23$
 - $\langle N_{\text{bin}} \rangle (40\text{-}60\%) = 70 \pm 18$
- Cu-Cu at 62.4 GeV:
 - $\langle N_{\text{bin}} \rangle (0\text{-}10\%) = 142 \pm 5.1$
 - $\langle N_{\text{bin}} \rangle (10\text{-}20\%) = 98.5 \pm 9.5$
 - $\langle N_{\text{bin}} \rangle (20\text{-}40\%) = 51.6 \pm 4.7$
 - $\langle N_{\text{bin}} \rangle (40\text{-}60\%) = 18.6 \pm 1.9$

Au-Au to Cu-Cu ratio: R_{AuCu}

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